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COMMISSIONING AND SITE ACCEPTANCE TESTING Tenant Improvement Supplement

FOR

GSA/NIAID

SITE LOCATION

**NIAID
Research and Development Computing
Facility (RDCF)
5601 Fishers Lane
Rockville, MD**

March, 2013 through October, 2014

**Procon Consulting LLC
&
EYP Mission Critical Facilities, Inc.
An HP Company**

13600 EDS Drive
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GSA / NIAID 5601 Fishers Lane RDCF Commissioning

EYP Mission Critical Facilities, Inc., a wholly owned subsidiary of HP

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I. Executive Summary

March 30, 2015

EYP Mission Critical Facilities (EYP MCF) was retained by Procon Consulting, LLC to provide commissioning services for the mechanical and electrical infrastructure of the NIAID 5601 Fishers Lane RDCF & Tenant Improvement located in 5601 Fishers Lane, Rockville, MD.

Commissioning is defined as a quality-oriented process for achieving, verifying, and documenting that the performance of facilities systems, and assemblies meets defined objectives and criteria. The test criteria used by EYP Mission Critical Facilities for the validation of NIAID 5601 Fishers Lane RDCF is the Engineer of Record's Basis of Design.

- Additional NON-RDCF Tenant Improvement Systems were commissioned over an eight month period January, 2014 through August, 2014.
- Deferred testing of the chilled water system economizer mode could not be validated or operated during the winter months 2014/2015 due to the very small data center chilled water load. The team decided that automatic transition to and from economizer mode is not stable and could result in system faults or failures. This condition was identified during the RDCF commissioning in December, 2013.
- Warranty review meeting was conducted on 10/21/2014 with NIAID, JBG and Thornton staff to review overall system conditions, lessons learned and major outstanding items.

A. Basis of Design

1. Electrical Basis of Design

The following requirements were verified for the electrical systems in NIAID 5601 Fishers Lane RDCF:

- 2,984kW IT load (542 watts/sq. ft)
- 2(N+1) utility feeds and substations
- N power distribution
- N+1 UPS systems
- N+1 parallel diesel generator plant

2. Mechanical Basis of Design

The following requirements were verified for the mechanical systems in NIAID 5601 Fishers Lane RDCF:

- 2,984kW IT load (542 watts/sq. ft)
- N+2 water-cooled chiller plant
- N+1 primary chilled water pumping system
- N+2 cooling towers

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- N+2 condenser pump
- N+2 computer room air handlers (CRAHs)
- 65°F supply air temperature +/- 2°F
- 40% relative humidity +/- 2% RH

B. Results and Acceptance

Based on the testing results, the commissioning team has concluded that the electrical and mechanical systems described in this report are operating as a complete critical building infrastructure. GSA/NIAID can expect the systems to operate in accordance with the basis of design. EYP Mission Critical Facilities recommends that GSA/NIAID institute or maintain established best practices for data center management in order to meet the expectations of availability throughout the life of the facility.

NIAID 5601 Fishers Lane RDCF was tested in accordance with the site acceptance test procedures developed by EYP MCF and approved by Procon Consulting, LLC. NIAID 5601 Fishers Lane RDCF demonstrated an ability to meet the Basis of Design with no critical outstanding deficiencies with the exception of the inability to operate in economizer mode in low load conditions.

Tenant Improvement construction, fit out and commissioning was completed with a staged approach through 2014.

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II. Commissioning Description

A. Scope of Work

Supplemental Commissioning Report for NON-RDCF Tenant Improvement Systems

B. Commissioning Documents Used

The following documents were used during the commissioning effort.

- See attached FPT forms for TI-Mechanical FPT for AHU, FCU, A/C Units, Lighting Control.
- See attached spreadsheet typical of all floors and areas validating VAV box operation and Unit Heaters.
- See attached Meeting Minutes
- See attached Meeting Agenda regarding deferred testing and warranty meeting.

C. LEED

- EA Prerequisite 1: Fundamental Commissioning of Building Energy Systems
 - The USGBC form is complete and updated.
 - CxA Gross SF of sample projects were updated in form EAp1.
 - Energy efficiency goals
 - Based on the BOD and SFO documents, systems and strategies incorporated into the design and construction...
 - RDCF Power Monitoring incorporated into the BMS system. PUE calculations are designed into the BAS power monitoring system to dynamically measure and record overall system power usage effectiveness to the Data Center.
 - RDCF UPS Systems. High Efficiency UPS, 5 ea. 750kva UPS systems installed with an efficiency measured at an average of 93.7% @50% load, 96.3% at 100% load.
 - Lighting Power Reduction Achieved = 23.88% per EAc1.1
 - Lighting Controls, per EAc1.2. Option C, Occupancy Sensors installed for 75% (79.13%) of the connected lighting load.
 - Chilled water system plate and frame heat exchanger for free cooling.
 - Variable Frequency Drives utilized for all large motors.
 - High Efficiency InRow Cooling Units and CRAH units utilized in the Data Center to minimize energy usage.
 - Air-To-Air Energy Recovery Equipment - LEED Submittals - EA4, EQ1
 - BAS System controlled Variable Air Volume boxes in all occupant areas with night time temperature setback and morning warm up.
 - HVAC Test and Balance performed at each phase of construction prior to occupancy.

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- Building occupant O&M personnel requirements.
 - O&M personnel attended training for all building systems over the course of construction and closeout documents. Copies of training attendance sign in sheets are uploaded to the USGBC EAp1.
- EAc2 – Enhanced commissioning documentation
 - Sample or final systems manual
 - A Modification to the CxA contract was issued to provide a detailed operations manual, this manual is in final QC and training with NIAID personnel as of 3/30/2015.

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III. Follow-up Items

Throughout the commissioning process, a commissioning running punchlist was maintained by the commissioning authority. This punchlist document was used as a means to track equipment compliance, defects, observations and recommendations, deviations from the test plan, tests not performed, and additional tests performed. In the following sub-sections, open items requiring repair and additional comments are presented. The full commissioning running punchlist can be found in the attached Appendix.

A. Open Items Requiring Repair or Retesting

The table below lists the items requiring repair or retesting. Items requiring repair are defects with the equipment installation or operation, or deviations from the contract documents that require explicit attention or acceptance.

B. Additional Comments and Recommendations

The table below includes additional comments, recommendations, and observations about the project. These notes can be used by the owner and operating staff to improve their working knowledge of the data center and equipment, or to understand the history behind decisions of involved parties made during the commissioning process.

- The Commissioning Action list is complete with all items closed out.

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IV. Conclusion

Based on the testing results, the commissioning team has concluded that the electrical and mechanical systems described in this report are operating as a complete critical building infrastructure. GSA/NIAID can expect the systems to operate in accordance with the basis of design. EYP Mission Critical Facilities recommends that GSA/NIAID institute or maintain established best practices for data center management in order to meet the expectations of availability throughout the life of the facility.

NIAID 5601 Fishers Lane RDCF was tested in accordance with the site acceptance test procedures developed by EYP MCF and approved by Procon Consulting, LLC. NIAID 5601 Fishers Lane RDCF demonstrated an ability to meet the Basis of Design with no critical outstanding deficiencies, however refer to Acceptance sections above and the Cx Action Item list for details of non-critical outstanding deficiencies and recommendations.